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5. april 6. /68

NOTE

ON THE

SURFACE-GEOLOGY OF LONDON;

WITH

LISTS OF WELLS AND BORINGS,

SHOWING THE

THICKNESS OF THE SUPERFICIAL DEPOSITS.

BY

WILLIAM WHITAKER, B.A. (LOND.), F.G.S.,

OF THE GEOLOGICAL SURVEY OF ENGLAND.

Extracted from the Appendix to the Report of the Medical Officer of the Privy Council for 1866.

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FOR HER MAJESTY'S STATIONERY OFFICE.
1867.

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Hitchin
April 6, 1868

Dear Sir

I am sorry that I have been unable to call on you, owing to a sudden start into the country with two of the new men who have lately joined the Survey; but I hope to have the pleasure of doing so when at home later in the year.

I send herewith a copy of a short Note on London Geology, which may be

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† For a good general account see Mr. Prestwich's capital little book "The Ground Beneath Us," Van Voorst, 1857.

interesting to you. It
may serve to show that
I am not a mere theorist
& don't neglect facts.

I am yours truly
W Whitaker

April 7. 1868 —
Midday Wedy —

My dear Sir

I am much obliged for your pamphlet — which I will give a place on my geological shelf. It is a good bit of genuine work. —

I am
Yours truly.

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NOTE

ON

THE SURFACE-GEOLOGY OF LONDON;

WITH

LISTS OF WELLS SHOWING THE THICKNESS OF THE SUPERFICIAL DEPOSITS.

1. DESCRIPTIVE NOTE.

This short note is only meant as an explanation to the list of wells and borings, which list it was thought would be more easily understood if prefaced by some account of the beds through which the sections were made.

It would be tedious and out of place to acknowledge here the many sources, either from published works or from personal information, whence the accounts of the wells, &c. have been derived, and I need only say that the borings along the lines of the great sewers have been taken from the large "Contract Drawings" of the Metropolitan Board of Works. Of course all the lists are simply abstracts of the sections, and treat only of the beds near the surface; the details would make a small volume.

As the whole has been written somewhat hastily, and at short notice, there may be many omissions; but I think that a very fair notion of the thickness and nature of the surface-deposits of London may be got from the lists and the description.*

The geology of London is fairly simple, both as to the number and the arrangement of the beds †, but of this I need not now treat; it will be enough for the present purpose to give a short account of the different deposits on which London is built. These may here be classed under four heads:—Modern Deposits, whether natural or artificial; Valley Drift, which, though of late age geologically, is not so in the ordinary sense; Old Tertiary Beds (chiefly London Clay), immeasurably older than the foregoing, but classed nevertheless amongst the newer geological formations; and the Chalk.

London is placed in a very broad valley cut out in the London Clay, &c., to a very small extent refilled by the Valley-drifts; and then again slightly cut down in parts.

A. MODERN DEPOSITS.

The word "modern" is applied in geology to anything that has taken place since the present order of things has existed; that is to say to everything of historic age.

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* A detailed account of the geology of the western half of London has been given in the "Geological Survey Memoir on Sheet 7" (1864), and the eastern part will be dealt with in like manner in the Memoir on Sheet 1.

† For a good general account see Mr. Prestwich's capital little book "The Ground Beneath Us," Van Voorst, 1857.

1. *Made Ground.*

Under this head are grouped the various accumulations made either purposely or incidentally during the growth of a large city, from the destruction of buildings, from the constant addition of "road-metal," from the filling up of hollows, from the improvement of low damp ground by an artificial covering of dry rubbish and gravel,* and from other like causes.

For the most part such deposits are permeable by water, and might be considered as an impure gravel.

2. *Alluvium.*

But a small part of London is built on modern river-deposit, and it is well that it should be so, for there can hardly be worse ground for houses than the low damp flats of clay and peat that fringe streams.

It is somewhat strange that a river as large as the Thames should have formed but a few very narrow strips of alluvial mud for many miles, and should then abruptly take its course through broad tracts of marshland; but to this fact, perhaps, we may look for the reason that determined the site of London. Above the city the river is bordered on either side by gravel, except for some trifling patches of alluvium; below there are broad marshes, the level of which is lower that that of the river at high tide.

The alluvium of the Thames is for the most part clayey, and therefore impervious to water.

B. VALLEY-DRIFT.

It is needless here to enter into a discussion of the evidence which has led geologists to conclude that the loam (or brickearth) and gravel of our valleys have been made by river-action; enough to say that the valley of the Thames contains a great quantity of such beds, that the greater part of London is built on them, and that they consist, as far as London is concerned, of gravel sand and loam, the first two of which must be grouped together.

3. *Brickearth.*

This loam, or mixture of clay and sand, is more local than the gravel on which it rests, though it nevertheless takes up some space. It is of a brown colour and of no great thickness, but being more or less clayey it tends to prevent water from sinking to the gravel.

4. *Gravel and Sand.*

The gravel of London consists almost wholly of flints and flint-pebbles in a sandy matrix, with occasional beds of sand, which last now and then make up nearly the whole of the deposit. The thickness is sometimes more than 20 feet, and the bed is of course highly permeable to water; indeed from it all the shallow wells are supplied, the clay generally found below not allowing the water to sink further.

Many of the lower districts of the valley of the Thames are less damp than the rising ground of the neighbourhood, because whilst the latter consists simply of clay, in the former there is a capping of gravel on the clay.

[Besides these Valley-drifts there is also a patch of GLACIAL DRIFT on the north, in the neighbourhood of Finchley. This is of older date than the former, and may here be divided into two:—(*a*) *Boulder Clay*, a stiff bluish clay with rounded lumps of Chalk and other rocks that show the common signs of glacial action; below which there is generally (*b*) *Gravel*, sandy, and made up chiefly of flint-pebbles.]

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* Belgravia, I believe, is in great part built on made ground, otherwise it would be lower and damper.

C. OLD TERTIARY BEDS.

5. *Lower Bagshot Sand.*

Two outliers of the fine sharp light-coloured sands which are found in mass in the neighbourhood of Bagshot, Aldershot, &c., occur on the hills of Hampstead and Highgate. This formation is permeable by water, which is often thrown out in springs near the outcrop of the underlying clay.

6. *London Clay.*

This is a stiff bluish-grey or brown clay, often with large nodular masses of clayey limestone known as *septaria*, and is of course impervious to water.

It underlies the gravel, &c., in nearly the whole of London, crops out to the surface along the boundary of the gravel north of the Thames, and to a large extent on the south also, and is cut into (through the gravel) by the shallow valleys of the Serpentine and the Fleet.

7. *Lower London Tertiaries.*

This division consists of a set of pebble-beds, sands, clays, and loams, arranged by geologists in three groups, the whole thickness of which does not exceed 120 feet near London.

The pebble-beds at the top are local, and occur only on the east. They are made up of flint-pebbles and sand, and therefore are permeable to water. (Oldhaven Beds.—" Basement-bed of the London Clay" of Mr. Prestwich.)

The sands, clays, &c., next below, are constant as to their occurrence, but ever varying as to their structure; at one place there being chiefly sand, and at another little but clay. (Woolwich and Reading Beds.)

The sand at the bottom thins to the west and north. It is a water-bearing bed, and many of the London wells have got their supply from it. (Thanet Sand.)

The "Lower London Tertiaries," as a whole, are more or less permeable, though water is sometime held back by the clays. They occur at once below the gravel, &c., on the north of the Thames, in the Isle of Dogs, and Stratford, and on the south they crop out from beneath the London Clay at Dulwich, Peckham, and New Cross, whilst further east, near Greenwich and Woolwich, they form a broad tract. Everywhere some part of the series comes between the London Clay and the Chalk.

D. CHALK.

This well-known soft white limestone is a great absorbent of moisture and therefore conduces to dryness at the surface, whilst being at the same time a reservoir of water underground. From it most of the deep wells of London draw their supply. It occurs everywhere beneath the Tertiary formations, but does not crop out in London, except over a small area near Lewisham and Deptford.

It is needless to describe the tracts taken up by the above beds, as Mr. Radcliffe has added a geological map of London and the neighbourhood to his Report, and the wells and borings of the following lists show what formations underlie the surface-deposits at their respective places.

Besides these borings, many good sections have been made at various times along the lines of the sewers and in other works. Thus the excavations for the Metropolitan Railway from Paddington to beyond Euston Square, showed a mass of gravel, &c., sometimes 20 feet thick, above the London Clay.

2.—LIST of LONDON WELLS, BORINGS, &c., to show the Thickness of the Superficial Deposits.

A. *North of the Thames.*

(The measurements in this and the following lists are in feet.)

—	Made Ground and Soil.	Alluvium.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
Bank of England - - - - - -	22	—	—	4	26	London Clay.
Blackfriars, Apothecaries' Hall - - - -	12	—	—	—	12	„
Blackwall, Trinity Wharf - - - - -	18	—	—	45 !	—	Clay (? London Clay, or does the "gravel" include some of the "pebble-beds" below the London Clay ?)
Bow, Berger's Starch Works - - - -	2	—	3	14	19	London Clay.
Brentford, cutting of South Western Railway at Kew Bridge - - - - - -	1	—	4	16	21	„
„ reservoir close to Kew Bridge - - -	—	—	—	—	15	„
Broad Street, Golden Square, Broadwood's Brewery -	—	—	—	10½	10½	„
Bromley, Joseph Foster's (an old well) - - -	—	—	—	—	18	„
Camden station, London and North Western Railway -	—	—	—	—	18	„
Chiswick, Griffin Brewery - - - - -	—	—	—	—	40	„
Coldbath Fields Prison - - - - -	23	—	—	7	30	London Clay (? thin and then other clay).
Covent Garden - - - - - -	—	—	—	—	25	London Clay.
Finsbury, White Cross Street - - - - -	—	16?	—	3	—	(Not bottomed).
Fishmongers' Hall, Northern End of London Bridge -	27		7	14	48	London Clay.
Golden Lane, City Baths and Washhouses - - -	6	—	—	14	20	„
Hampstead Road, at Reservoir, lately destroyed - -	6	—	—	17	23	„
Horsleydown, Anchor Brewery (Courage & Co.) - -	—	—	—	—	32	„
Hoxton - - - - - - - -	—	—	—	—	18	„
Isle of Dogs : Nicholay Graham, & Co., Cumberland Oil Mills	1	—	—	38	39	Under "gravel" is most likely included some of the pebble-beds below the London Clay.
Kensington Brewery - - - -	—	—	—	—	27	—

List of London Wells, Borings, &c., to show the Thickness of the Superficial Deposits—*continued.*

—	Made Ground and Soil.	Alluvium.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
Kensington Gardens (N.E. corner. -To supply Serpentine)	2	—	—	—	2	London Clay.
,, Horticultural Society	18	—	—	22	40	,,
,, Workhouse	8	—	—	3	11	,,
Lea Bridge Waterworks	—	—	—	—	14	,,
,, ,, (another well)	—	—	—	—	9	,,
Limehouse, Lead Island Works	9 6¾	—	—	5½ 5¾	14½ 12½	Clay touched.
,, Union Schools	5	—	11½	—	—	Not bottomed.
Lombard Street, St. Mary's Woolnoth	—	—	—	Thickness not given.	—	London Clay.
London Docks	—	—	—	—	37	,,
Long Acre, Combe & Co's Brewery	—	—	—	—	15	,,
Mile End, Mann and Crosmann's Brewery	—	—	—	10	10	,,
Marylebone Road, Messrs. Staines' Brewery	9	—	—	24½	33½	,,
Mile End Road, City of London Union	4	—	2	29	35	,,
Millbank, Seager's Distillery	22½	—	—	3	25½	,,
Minories, London and Blackwall Railway	15?	—	—	9	24	,,
Notting Dale, near Notting Hill	12	—	—	5	17	,,
Orange Street, near the National Gallery	15	—	—	15	30	,,
Pimlico, Cubitt's Workshop	6	7	—	22	35	,,
,, Simpson's Factory, Grosvenor Road	7	—	—	19	26	,,
Plaistow Marsh, opposite Woolwich Dockyard	—	12¾	—	23¼	36	Chalk.
Poplar, High Street	—	—	—	—	30	London Clay.
,, ,, (end of Woodstock Road)	3	—	—	12	15	,,
,, ,, (opposite Queen Street)	3	—	—	19	22	,,
,, ,, (near to Sophia Street)	2	—	—	9½	11½	,,
,, ,, (opposite the " White Horse ")	3	—	—	14	17	,,
,, Workhouse, north end, east wing	—	15	—	—	15	Clay.

List of London Wells, Borings, &c., to show the Thickness of the Superficial Deposits—*continued.*

—	Made Ground and Soil.	Alluvium.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
Poplar Workhouse well, Master's garden	2½	7½	—	Sand. 14	—	Gravel.
Ratcliffe, Ravenhill and Co., Glasshouse Fields	13	—	—	6	19	"
Saint Catherine's Docks	—	—	—	—	40	"
Shoreditch Workhouse	10	—	—	8	18	London Clay.
" Truman and Hanbury's Brewery	9	—	6	7½	22½	"
Stepney, Holt's Brewery	—	—	—	14	14	"
Stratford, Savill's Brewery	7	—	—	5	12	Clay (? London Clay) thin; then sand (Woolwich Beds).
Tottenham Court Road, Meux's Brewery	—	—	—	—	19	London Clay.
Tottenham Gasworks	3	—	—	11	14	" (thin).
" J. Foster's (an old well)	—	—	20		20	London Clay.
" Warne's India Rubber Works	—	—	—	—	15	" (thin).
Tower Hill, Royal Mint	11	—	—	13	24	London Clay.
Trafalgar Square, in front of the National Gallery	9	—	—	14	23	"
West Ham (Union)	—	—	—	16	16	Sand of Woolwich Beds.
"	8	—	—	9	17	Clay, sand, &c.
West India Docks, south side of Export Dock	15?	—	5	25?	45?	Sand (of Lower London Tertiaries).
Westminster Bridge	27?	—	—	—	27?	London Clay.
Westminster, Cooke's, Swallow Street (an old well)	—	—	18		18	"
" Elliott's Brewery	—	—	—	—	32	"
" Old Pye Street	6	11½	—	13	30½	"
" Thorne's Brewery	—	—	—	—	27½	"
" Artillery Brewery, Victoria Street	—	—	—	—	37	"
Whitechapel, Kirk and Dyck's, Osborne Place	6	—	6	12	24	"
" Smith's Distillery	7	—	—	22	29	"
" Walton's Sugar House, Angel Court	6	—	—	12	18	"

List of London Wells, Borings, &c., to show the Thickness of the Superficial Deposits—*continued.*

B. *South of the Thames.*

<table>
<tr><th>——</th><th>Made Ground and Soil.</th><th>Alluvium.</th><th>Brick Earth (Loam).</th><th>Gravel and Sand.</th><th>Total Depth of Superficial Deposits.</th><th>Beds below.</th></tr>
<tr><td>Balham Hill, near Clapham Common</td><td>—</td><td>—</td><td>4</td><td>10</td><td>15</td><td>London Clay.</td></tr>
<tr><td>Barnes</td><td>—</td><td>—</td><td>—</td><td>—</td><td>13</td><td>”</td></tr>
<tr><td>Battersea, Jones & Co.'s Starchworks, York Road</td><td>—</td><td>—</td><td>—</td><td>—</td><td>32</td><td>”</td></tr>
<tr><td>Blackfriars Road, Duke Street, Stamford Street, Messrs. Clowes, Printers.</td><td>8</td><td>—</td><td>—</td><td>18</td><td>26</td><td>”</td></tr>
<tr><td>Bermondsey Street</td><td>—</td><td>12</td><td>—</td><td>20? (sand)</td><td>32</td><td>”</td></tr>
<tr><td>Deptford Creek, Bridge Road, near the bridge</td><td>6</td><td>14</td><td>—</td><td>6</td><td>26</td><td>Clay.</td></tr>
<tr><td>” Kent Waterworks</td><td>—</td><td>—</td><td>—</td><td>—</td><td>27</td><td>Chalk.</td></tr>
<tr><td>” another boring a few yards off</td><td>—</td><td>—</td><td>—</td><td>—</td><td>30</td><td>”</td></tr>
<tr><td>Garret Copper Mills, near Wandsworth</td><td>—</td><td>—</td><td>—</td><td>9</td><td>9</td><td>London Clay.</td></tr>
<tr><td>Greenwich Hospital</td><td>—</td><td>10</td><td>—</td><td>35*</td><td>—</td><td>* Including some of the pebble-bed of the upper part of the Lower London Tertiaries.</td></tr>
<tr><td>Greenwich Marsh, opposite Green's Dock</td><td>20¾</td><td>—</td><td>—</td><td>12</td><td>32¾</td><td>London Clay?</td></tr>
<tr><td>Lambeth, Bethlehem Hospital</td><td>—</td><td>—</td><td>—</td><td>28†</td><td>28</td><td>† ? Including made ground.—London Clay beneath.</td></tr>
<tr><td>” Charing Cross Railway, William Street</td><td>7</td><td>1</td><td>—</td><td>Touched.</td><td>—</td><td>——</td></tr>
<tr><td>” Goding's Brewery, Belvidere Road</td><td>15</td><td>—</td><td>—</td><td>15</td><td>30 (or more)</td><td>London Clay.</td></tr>
<tr><td>” York Mead</td><td>—</td><td>—</td><td>—</td><td>—</td><td>30</td><td></td></tr>
<tr><td>Mortlake Brewery</td><td>—</td><td>—</td><td>—</td><td>10</td><td>10</td><td>”</td></tr>
<tr><td>” Randell's, within 100 feet of the Thames (an old well)</td><td>—</td><td>—</td><td>—</td><td>20</td><td>20</td><td>”</td></tr>
<tr><td>Old Kent Road, Cooper's Road</td><td>6</td><td>2¼?</td><td>—</td><td>10¼</td><td>—</td><td>——</td></tr>
<tr><td>” Hatcham Park Road, Five Bells Lane</td><td>2</td><td>—</td><td>8</td><td>—</td><td>10</td><td>Clay and Sand (? gravel).</td></tr>
<tr><td>Plumstead Marsh, E. of the practice-butt, Royal Arsenal</td><td>—</td><td>24</td><td>—</td><td>11</td><td>35</td><td>Thanet Sand; then Chalk.</td></tr>
<tr><td>Rotherhithe, under a shed at the Globe Dock</td><td colspan="2">12?</td><td>—</td><td>23½</td><td>35½?</td><td></td></tr>
<tr><td>South Eastern Railway, Angerstein's Wharf</td><td>—</td><td>7</td><td>—</td><td>12</td><td>19</td><td>Chalk.</td></tr>
<tr><td>Southwark, Barclay's Brewery</td><td colspan="2">21</td><td>—</td><td>6½</td><td>27½</td><td>London Clay.</td></tr>
<tr><td>” Guy's Hospital</td><td>8</td><td>6</td><td>—</td><td>19</td><td>33</td><td>”</td></tr>
<tr><td>Stockwell Green, British Brewery (Waltham's)</td><td>—</td><td>—</td><td>—</td><td>15</td><td>15</td><td>”</td></tr>
<tr><td>Walworth, Lorrimore Road, near Surrey Zoological Gardens</td><td>1</td><td>—</td><td>—</td><td>15¼</td><td>—</td><td>——</td></tr>
</table>

3.—BORINGS.

N.B. The figures and letters preceding the localities of the borings are the same as those in the "Contract Drawings" of the Metropolitan Board of Works, from which the facts are taken.

(A.) *North of the Thames.*

(*a*) *Borings along the Line of the* "OUTFALL SEWER, NORTH SIDE."

—	Made Ground and Soil.	Alluvium.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
53–80. Across the "Thames Marshes (East Ham Level)," through alluvial clay and peat to gravel. (The gravel under the alluvium of the Thames is always saturated and bleached.)						
46–52. Across the flat of valley gravel, &c. S. of East Ham. Through "surface-earth," loam, and gravel.						
45. About ½ mile westward of East Ham Church - -	1	—	3	7	11	Clay.
42–44. Between Plaistow and East Ham, gravel, sand, and clay						
41. S. of the middle of Tun Marsh Lane - - -	—	—	—	13?	13	"
32–40. S.E., S. & W. of Plaistow, in gravel, &c., with a little surface-earth.						
31? Near railway S. of West Ham - - - -	3	—	1	9	13	"
28–30. From the above westward to just W. of North Woolwich Railway. Through a little surface earth and clay, and then gravel.						
27. E. side of streams. Abbey Mill Toll Bar - - -	4½	6	—	5	15½	"
26. Between " " " - - -	10	8 or more	—	—	18	"
25. W. side of " " " - - -	10	10	—	2	22	"
1–24. From S. of Abbey Mill Toll Bar to the River Lea, a little S. of Old Ford Lock. Through "surface-earth" and alluvial clay and peat of the Lea to gravel.						

(*b.*) BORINGS along the Line of the "LOW LEVEL SEWER, NORTH SIDE," MAIN LINE.

——	Made Ground and Soil.	Brick Earth.	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
1. A little S. W. of Abbey Mill Toll Bar - - - -	2 or 4	—	12 or 14	16	Clay 2 feet, then sand 25 feet, then clay.
2. " " N. E. of "Three Mills and Bridge" - - - -	6½	—	19	22	Clay.
3. " " W. " " " - - - - - -	9	—	2	11	"
4. " " S. of junction of Three Mills Lane and Four Mills Street -	3½	—	17½	21	"
5. Between Four Mills Street and East and West India Docks Railway -	2½	—	12½	15	"
6. Junction of Glaucus Street and Devon's Lane. - - -	1	10		11	"
7. A little W. of crossing of Bow Common Lane and railway - -	3½	19½		23	London Clay.
8. Devon's Lane. A little East of North London Railway - -	6	—	7½	13½	"
9. Eastern side of Salmon's Lane Bridge (over Regent's Canal) - -	8½	—	8½	17	"
10. Commercial Road (where the North London Railway crosses) -	5	—	12	17	"
11. Junction of Butchers Row and Brook Street - - -	5½	7	—	12½	Clay.
12. " " Devonport Street - - - - - -	15	—	11½	26½	London Clay.
13. Back Road (where joined by continuation of Sutton Street) - -	7	—	18	25	"
14. Junction of Back Road and Cannon Street Road - - -	7	5½	15½	28	"
15. " " Cable Street and Leman Street - - - - -	9	—	10	19	"
16. Near western end of Royal Mint Street - - - -	17	—	13	30	"
17. Tower Hill, eastern end of Great Tower Street - - -	5½	—	11½	17	"
18. Eastern end of Eastcheap - - - - - - -	15	9	11½	35½	"
19. North of Statue, King William Street - - - -	11	—	25	36	"
20. Cannon Street (where the lane from the Mansion House crosses) -	19	—	—	19	"
21. " " (near crossing of street, between Bread Street and Queen Street - - - - - - - -	13	—	14	27	"

BORINGS along the Line of the "LOW LEVEL SEWER, NORTH SIDE," HACKNEY WICK BRANCH.

——	Made Ground and Soil.	Brick Earth (Loam).	Gravel and Sand.	Total depth of Superficial Deposits.	Beds below.
A. Triangle of roads a little south of Bow Bridge	5½	—	11	16½	Clay.
B. Corner of Old Ford Road, W.	6	—	—	6	„
C. Old Ford Road just North-east of Southern end of Sounding Alley	3	—	8	11	„
D. „ „ half way between the above and Old Ford Lock	3	—	2	5	„
(*c.*) BORINGS on the Line of the "MIDDLE LEVEL SEWER, NORTH SIDE," MAIN LINE.					
1. Near to, and about equal distances from Sir G. Duckett's Canal, the North London Railway, and Old Ford Road (close to footpath over Canal) and near Junction with High Level Sewer	—	—	—	5¾	London Clay.
2. Old Ford Road, near corner of Beale Road	4½	—	17½	22	„
3. „ „ (a little east of where it crosses the Canal	4	—	17½	21½	„
4. Eastern side of Regent's Canal, near Twig Folly Bridge at Old Ford Footpath.	2	—	17	19	„
5. A little west of the Canal, at the end of Green Street	4	? 3	18¾	25¾	„
6. Morpeth Street, near Green Street	4¼	? 2	15¾	22	„
7. Bethnal Green Road, Eastern end (Cambridge Road)	4½	—	6½	11	„
8. „ „ Squerries Street	5¾	13¼		19	„
9. High Street, Shoreditch, end of Church Street	4¼	4½	9¾	18½	„
10. Tabernacle Square, near corner of City Terrace	11¼	?	—	—	„
11. Old Street, near the end of Bunhill Row	15	—	4½	19¼	„
12. Junction of Old Street with Goswell Street	19¾	—	5	24¾	„

Borings on the Line of the "MIDDLE LEVEL SEWER, NORTH SIDE," MAIN LINE—*continued.*

——	Made Ground and Soil.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
13. St. John Street, north of Wilderness Row - - - -	8¾	—	9¼	18	London Clay.
13b. St. John's Square, near the corner of Albemarle Street - -	21	—	—	21	„
13a. „ „ Ledbury Place - - - - -	9	—	14	23	„
14. Red Lion Street, near the corner of Red Lion Mews - -	8¾	—	5	13¾	„
15. Clerkenwell Green, near South-east corner of Sessions House -	6½	—	9¾	15¼	„
16. Turnmill Street, „ „ „ - -	2½	—	8½	11	„
17. A little west of last, east side of Fleet Sewer, opposite Sessions House	15	4		19	„
18. Western side of Fleet Sewer, at end of Vine Street - - -	16¼	—	3	19¼	„
18a. Little Saffron Hill, near corner of „ - - - - -	11¼	—	1¾	13	„
19. Back Hill, at corner of Christopher Street - - - - -	8¾	—	6¼	15	„
20. Junction of Leather Lane and Liquorpond Street - - -	10	—	10½	20½	„
21. Crown Court, Liquorpond Street - - - - -	7½	4	3½	15	„
22. At corner of King's Road, Grays Inn Lane - - - -	14½	6	—	20¼	„
23. At junction of Bedford Row and Theobalds Road (junction with Piccadilly Branch sewer) - - - - - -	10½	—	11	21½	„
24. At junction of Kingsgate Street and Orange Street - - -	5¾	6	9½	21¼	„
25. At junction of Hart Street and Museum Street - - -	7¾	2	10½	20¼	„
26. At junction of Oxford Street, and Newman Street - - -	9¾	—	17¾	27½	„
27. Regent's Circus, Oxford Street - - - - -	20½	—	13	33½	„
28. Junction of Oxford Street and Duke Street - - - -	8¼	5¾	—	14	„
29. Junction of Oxford Street and Cumberland Street opposite the Marble Arch - - - - - - - -	8	25½		33½	
f. Bayswater Road, Albion Street - - - - - -	5	—	14	19	„
c. „ between Albion Street and Hyde Park Street -	4	—	16	20	„
d. „ street west of Hyde Park Street - - -	4	—	4	8	„
c. „ a little east of Victoria Gate - - -	5½	—	8½	14	„

Borings on the Line of the "MIDDLE LEVEL SEWER, NORTH SIDE," MAIN LINE—*continued.*

——	Made Ground and Soil.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
b. Bayswater Road, Buck Hill Gate - - - - - -	3¾	—	6	9¾	London Clay.
a. " " (E. side of), Grand Junction Road - -	8¼	—	—	—	? Alluvial Clay, &c.
30. " " opposite Porchester Terrace (W. side) - -	3½	—	8¾	12½	London Clay.
31. " " corner of Pembridge Gardens, near Notting Hill Toll Gate - - - - - - - -	2½	6	15	23½	"
32, 33, 34. To the North.—Mould, &c. on London Clay.					
COPPICE ROW BRANCH.					
1. Junction of Coppice Row and Bowling Green Lane - - -	6¾	—	—	6¾	Gravelly Clay, then London Clay.
2. Bagnigge Wells Road (opposite Guildford Street East) - -	2¼	2¼	4	8½	London Clay.
3. " " " S.S.W. of Granville Place - - -	13	—	—	13	Gravelly Clay, then London Clay.
PICCADILLY BRANCH.					
1. N.E., Corner of Lincoln's Inn Fields - - - - -	8	—	11¼	19¼	London Clay.
2. Junction of St. Martin's Lane and Long Acre - - -	13	—	? 1½	14½	"
3. Piccadilly, Regent Circus - - - - - -	10½	—	6¾	17¼	"
4. " Half Moon Street - - - - - -	3½	—	—	3½	"

(*d*) BORINGS along the line of the "WESTERN SEWERS."

——	Made Ground and Soil.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
1. Corner of King's Road and Bagleys Lane (S.E. of Walham Green)	2¼	3¾	16	22	London Clay.
2. South of St. John's Church, Walham Green	5	—	25¼	30¼	,,
3. William Street, nearly half a mile west of above	3¾	—	17¾	21½	,,
4. Fulham Road, opposite Greyhound Lane	3¼	?13¼	9¾	26½	,,
5. Hammersmith, Junction of George Street and Cut Throat Lane	3¼	5	19¼	27½	,,
6. ,, Upper Mall a little E. of Grove Road	3¾	?8¼	11	23	,,
7. King's Road, E. end of Parson's Green (Fulham Branch)	3½	3¾	16½	23¼	,,
8. Fulham Junction of King's Road and Back Lane	3½	—	29	32½	,,

(*e*) M.S. BORINGS. (Metropolitan Board of Works.) (N. Side of the River.)

The Letters preceding the Localities of the Borings are the same as those in the M.S. Drawings in the Office of the Board of Works.	Made Ground and Soil.	Alluvium.	Brick Earth.	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
Stoke Newington, Rectory Road } Along the line of the Northern High Level, Lewes.	—	—	2	22½	24½	London Clay.
Victoria Park, by Wick Lane	2	—	4	13	19	,,
Wick Lane, Bow, near the River Lea	—	—	3⅓	8	11½	,,
J. 1¼ furlongs S.W. of East Ham Tollgate (Barking Road)	3	—	—	31½	34½	,,
K. 880 feet N.W. of junction of Green Street and the Barking Road	2½	—	6½	2⅒	11¼	,,
L. 2¼ furlongs S.S. by E. of Plaistow church	1½	—	4½	6	12	,,
Q. Devon's Lane, Bromley (just north, of No. 5, boring on the north side low level below the sewer.)	—	—	—	—	19¼	,,
R. North London Railway Station, Bow. (This boring must have been made below the natural surface of the ground, as there is much gravel hereabouts.)	—	—	—	5	5	,,
S. Regent's Canal, New Mile End Lock	2½	—	—	22	24½	,,
U. Widnall's Place, Vine Street, Saffron Hill	10	—	5	2	17	,,
V. W. } Near Regent's Canal, Cambridge Heath Bridge	6	—	—	20	26	,,

M.S. BORINGS. (Metropolitan Board of Works.) N. Side of the River.

—	Made Ground and Soil.	Alluvium.	Brick Earth.	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
A^1. Along the bank of the Thames. Westminster, Regent Street	6	4	—	23	—	—
B^1. Percy Wharf	—	11	—	21	32	London Clay.
C^1. Adelphi, Henderson's Wharf	—	—	—	—	20 or 28½	”
D^1. Somerset House	—	—	—	20	20	”
E^1. West end of Temple Gardens	—	—	—	—	30	”
F^1. Waterman's Alley	14	—	—	25	40	”
D^1. Turnstile N.E. corner of Lincoln's Inn Fields (close to boring No. 1. of the "Piccadilly Branch" of the Middle Level Sewer)	9	—	7	6½	22½	”
G^1. Bridge Street, Blackfriars, junction with Earl Street	25	1	—	7	33	”
H^1. Rutland Street, Upper Thames Street	2	—	—	—	2	”
I^1. Opposite Paul's bakehouse, Godliman Street	7½	—	3	16	26½	”
J^1. Old Fish Street, opposite Moor's yard	10	—	1	26½	37½	”
P^1. Charles Street (Back Road) just S. of the Blackwall Railway	4	—	—	20½	24½	”
Q^1. White Horse Street, Commercial Road (? same as or close to boring 11 of Low Level Sewer, N. side)	7¼	—	6½	—	13¾	”
R^1. Dalgleish Street, Commercial Road	5½	—	—	10¾	16¼	”
S^1. Limehouse Cut, Britannia Bridge	8	—	—	7½	15½	”
S^2. Limehouse, Rixbie's Rope Walk	—	—	—	6½	6½	”
S^3. Limehouse Lock, near	—	—	—	7¼	7¼	”
S^1. - - -	—	—	—	15¾ (sand)	15¾	”
T^1. Limehouse Causeway, junction with Spread Eagle	7½	—	5	15	27½	”
V^1. Limehouse Cut, Stink House Bridge	2	—	3½	4	9½	”
V^1. ” ” Four Mills ”	—	—	—	2	2	”
W^1. Corner of Peter Street, Four Mills Street	13	—	—	10	23	”
W^2. Limehouse Cut. W. of Bromley Lock	13	—	—	8¼	21¼	”

M.S. BORINGS. (Metropolitan Board of Works.) N. Side of the River—*continued.*

—	Made Ground and Soil.	Alluvium.	Brick Earth.	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
W³. Limehouse Cut, N.W. of Bromley Lock - - -	4¼	10¾	—	6½	21½	London Clay.
X¹. Poplar, in Bow Lane, near junction with High Street .	3½	—	—	13	16½	”
Y¹. Blackwall, N. of West India Dock entrance - -	16	7½	—	26½	(Not bottomed).	
Z¹. ” S. of South Dock entrance - - -	11¼	20¾	—	15	”	

(*f*) M.S. BORINGS, RIVER LEA NAVIGATION.

The Numbers preceding the Localities of the Borings are the same as those in the large Plan of the River Lea Navigation.	Made Ground and Soil.	Alluvium.	Gravel, &c.	Total.	Beds below.
1 to 16 are above Tottenham.					
17. On E. side of Canal, above Tottenham Mills Lock - - -	1½	4½	11	17	London Clay.
18. ” ” a little below the stream from the former “Copper Mills,” Walthamstow - - - - - -	1½	11	17½ (with a little clay).		
19. On E. side of Canal, a little above the high road, Lea Bridge -	1½	11?	18		
20. ” W. ” close below Sir G. Duckett's Canal - -	2	8½	8	18½	Clay.
21. ” ” ” near Old Ford Lock - - - -	6	1½?	18⅓	26	”
22. ” E. ” near Hunter's Mill, just below the Great Eastern Railway and the Reservoirs of the East London Water Company -	1¼	5½	20	26¾	”
23. Between Canal and River, Bromley Flood-gates - - -	4¼	12¾	7	24	”
24. ” ” ” Lock - - - - -	14	—	12 (with clay)	26	”
25. Narrow Street, Limehouse - - - - - -	12	—	18 (sand)		

(B.) *South of the Thames.*

(*a*) BORINGS along the line of the "OUTFALL SEWER, SOUTH SIDE."

——	Made Ground and Soil.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
1. Same as No. 14, Bermondsey Branch, Low Level Sewer.					
2. Greenwich Junction of Romney Road and King Street - -	5	5½	15*	—	*Not bottomed.
3. Greenwich and Woolwich Lower Road, opp. Vicarage Lane -	1	—	23	24	Chalk.
4. „ „ „ Coombe Farm Lane -	6	—	24½	30½	„
5. „ „ „ Charlton Toll Bar -	5	—	—	5	„
6. Woolwich. Junction of Albion Road and Sand Street, S.W. corner of Dockyard - - - - - - -	*	—	*	17	„
7. „ „ „ Harden Street - -	2	—	—	2	12ft. of Thanet Sand, then Chalk.
8. North side of South-eastern Railway near eastern end of tunnel in rear of Edward Street - - - - - - -	2	—	—	2	50 „ „ „
9. Northern side Beresford Square, end of Beresford Street - -	3¼	—	—	3¼	47 „ „ „
10. Plumstead Road, a little before it crosses the Railway - -	1	—	—	1	48 „ „ „
11. 12. 13. In Plumstead Marsh, just beyond the limit of the 6-inch Ordnance Map, show 14 to 18 feet of alluvium underlaid by a thick bed of gravel. The borings at the Crossness Works are of the same kind.					

(*b.*) BORINGS along the Line of the "LOW LEVEL SEWER, SOUTH SIDE," MAIN LINE.

——	Made Ground and Soil.	Brick Earth.	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
1. Putney. In Wandsworth Lane, a little E. of Brewhouse Lane -	2½	—	23½*	—	* Not bottomed.
2. Wandsworth. In Wandsworth Lane, just E. of the South-western Railway	—	—	15½	15½	London Clay.
3. " High Street, half way between Love Lane and Ram Lane	4½	—	7½	12	"
4. " Junction of York Road and North Street - -	—	6	17	23	"
5. " " " Jews Row - - -	1½	—	15*	—	* Not bottomed.
6. York Road, Battersea Creek - - - - - -	3¼	—	21¾	25	London Clay.
7, 8, 9, 10, along Battersea Road, in Gravel, &c., from 15 to 25 feet -		Not bottomed.			
11. London Gasworks, Nine Elms - - - - -	12*	—	38	50	Clay touched. * Including what seems to be alluvium.
12. Wandsworth Road, Junction of, and Nine Elms - - -	3	—	17*	—	* Not bottomed.
13. Kennington Oval (Harleyford Street) - - - - -	1½	—	22¼	23¾	London Clay.
14. James Street, Camberwell New Road, (just N. of junction with Vassal Road) - - - - - - -	1¾	1½	6	9¼	"
15. Camberwell Road, Grosvenor Street - - - - -	1	4½	16½	22	Sandy Clay.
16. Neate Street, John Street - - - - - -	1½	2½	14	18	Sand, &c. of Woolwich Beds.
17. " just W. of Trafalgar Road - - - - -	5	—	—	14	
18. Old Kent Road, close to Grand Surrey Canal - - -	7 underlaid by 27½ feet of Sands.				
19. " Shenton Street - - - - -	3	—	29*	—	* Not bottomed.
20. " White Post Lane - - - - - -	1½	5	24½*	—	* Not bottomed.
21. " Cold Blow Lane - - - - - -	2½	—	21¼	23¾	Thanet Sand (10 feet) then Chalk
22. Cold Blow Lane, a little northward of the above - - -	—	7	16	23	Chalk.
23. New Cross, Clifton Road, just S. of Edward Street - - -	—	—	32½*	—	* Not bottomed.

Borings along the Line of the "LOW LEVEL SEWER, SOUTH SIDE," BERMONDSEY BRANCH.

——	Made Ground and Soil.	Alluvium.	Brick Earth.	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
1. Spa Road, near St. James' Church - - -	2 underlaid by 40 feet of sand and gravel, with a little clay ; then clay.					
2. Blue Anchor Lane, half-way between Bermondsey Low Road and the South-eastern Railway - - -	3¼	—	?3¾	9½	—	Not bottomed.
3. In Cork's Orchard - - - - - -	2½	—	5½	18	26	Sand and clay, 27 feet.
4. Jamaica Level - - - - - - -	4	4?	—	15	—	Not bottomed.
5. In Cart Road, leading to Gomm Road - - -	2	—	5	13	20	Sand, with a little clay ; 35 feet.
6. Deptford Lower Road, at China Hall Toll Gate - -	1½	?16½	—	19	37	Sand ; 15 feet.
7. " " 260 feet north-west of the Thames Junction Railway - - - - - -	2	3	—	17 (sand)	—	
8. Deptford Lower Road, Black Horse Bridge (Grand Surrey Canal) - - - - - - -	5	—	4	11	—	Not bottomed.
9. Evelyn Street, 350 feet from Black Horse Bridge -	5	—	—	19½	24½	7 feet sand (Thanet) then Chalk.
10. " High Street - - - - -	5½	—	—	36½	—	Not bottomed.
11. Deptford, " Giffin Street - -	7½	—	—	35½	—	"
12. " Flood Street, in rear of houses at east side of street, and a little south of the Greenwich Railway.	5	—	4	24	33	Sand ; 14 feet.
13. " Creek, Gasworks - - - -	13		—	20½	—	
14. " " in Williams' Tan Yard - - -	1½	7¾	—	17¾	27	Sand (of Lower London Tertiaries) 26 feet.

(*c.*) BORINGS along the Line of the "HIGH LEVEL SEWER, SOUTH SIDE."

——	Made Ground and Soil.	Alluvium.	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
MAIN LINE.					
1. Deptford Broadway, Church Street	3	9½		—	——
2. New Cross, Mr. Trowel's farm, S. of Queen's Road	6	—	—	3	Clays and sands of Woolwich Beds.
3. Peckham, Eastwood's brickyard, W. of St. Mary's Church	2½	—	—	7	„ „
4. „ Denham Road, just W. of Lyndhurst Road	3	2	2	2½	„ „
5. Camberwell, Crespigny Park, E. of Denmark Hill	2	13½	10¾	26¼	London Clay.
6. „ near N.W. corner of Lilford Road	—	—	29	—	——
7. West corner of Stockwell Green	2½	—	10	12½	London Clay.
8. Stockwell, private road, junction of New Street and Bedford Row, just E. of Clapham Rise.	½	—	—	½	„
9. "The Plough," Eastern corner of Clapham Common	2½	—	9½	12	——
EFFRA BRANCH.					
10. Cemetery Road, about S.S.E. of St. Mary's Church, Peckham	3	—	—	3	Clays and sands of Woolwich Beds.
11. Southern end of Nunhead Green	2½	—	—	2½	London Clay (thin); then sand and clay of Woolwich Beds.
12. Peckham Rye Road, where joined by the East Dulwich Road	1	—	—	1	Clay and sand of Woolwich Beds.
13. Lordships Lane, nearly a quarter of a mile S. of Goose Green	2½	—	—	2½	„ „
14. 15. } Five Fields, Dulwich (S. and W. ends of), 12 or 15 feet of London Clay over Woolwich Beds.					
16. Dulwich, fork of the roads	2	—	—	2	Clays of the Woolwich Beds.
17. „ Common, Croxted Lane	1	—	—	1	London Clay.

(*d.*) BORINGS along the "THAMES EMBANKMENT, SOUTH SIDE."

——	Made Ground and Soil.	Brick Earth (Loam).	Gravel and Sand.	Total Depth of Superficial Deposits.	Beds below.
1 to 6 are in the bed of the river.					
7. Lambeth, Lower Fore Street, east end of Doulton's Pottery - -	3½	—	18½	22	London Clay.
8. " N. of Fore Street, from east end of Stiff's Pottery - -	12	—	19½	31½	"
9. " York Wharf - - - - - -	7	—	17¾	24¾	"
10. " White Bear Alley, Upper Fore Street - - -	5	3¾	18	26¾	"
11. " Upper Fore Street, close to White Gun Alley - -	5½	—	19½	25	"

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